755

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Annotated Bibliography and Subject Index on the Summer Flounder, *Paralichthys dentatus*

Paul G. Scarlett

March 1982

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728. Vertical sections of semimonthly mean temperature on the San Francisco-Honolulu route: From expendable bathythermograph observations, June 1966-December 1974. By J. F. T. Saur, L. E. Eber, D. R. McLain, and C. E. Dorman. January 1979, iii + 35 p., 4 figs., 1 table.

729. References for the identification of marine invertebrates on the southern Atlantic coast of the United States. By Richard E. Dowds. April 1979, iv + 37 p.

730. Surface circulation in the northwestern Gulf of Mexico as deduced from drift bottles. By Robert F. Temple and John A. Martin. May 1979, iii + 13 p., 8 figs., 4 tables.

731. Annotated bibliography and subject index on the shortnose sturgeon, *Acipenser brevirostrum.* By James G. Hoff. April 1979, iii + 16 p.

732. Assessment of the Northwest Atlantic mackerel, *Scomber scombrus,* stock. By Emory D. Anderson. April 1979, iv + 13 p., 9 figs., 15 tables.

733. Possible management procedures for increasing production of sockeye salmon smolts in the Naknek River system, Bristol Bay, Alaska. By Robert J. Ellis and William J. McNeil. April 1979, iii + 9 p., 4 figs., 11 tables.

734. Escape of king crab, *Paralithodes camtschatica,* from derelict pots. By William L. High and Donald D. Worlund. May 1979, iii + 11 p., 5 figs., 6 tables.

735. History of the fishery and summary statistics of the sockeye salmon, *Oncorhynchus nerka,* runs to the Chignik Lakes, Alaska, 1888-1956. By Michael L. Dahlberg. August 1979, iv + 16 p., 15 figs., 11 tables.

736. A historical and descriptive account of Pacific coast anadromous salmomid rearing facilities and a summary of their releases by region, 1960-76. By Roy J. Wahle and Robert Z. Smith. September 1979, iv + 40 p., 15 figs., 25 tables.

737. Movements of pelagic dolphins (*Stenella* spp.) in the eastern tropical Pacific as indicated by results of tagging, with summary of tagging operations, 1969-76. By W. F. Perrin, W. E. Evans, and D. B. Holts. September 1979, iii + 14 p., 9 figs., 8 tables.

738. Environmental baselines in Long Island Sound, 1972-73. By R. N. Reid, A. B. Frame, and A. F. Draxler. December 1979, iv + 31 p., 40 figs., 6 tables.

739. Bottom-water temperature trends in the Middle Atlantic Bight during spring and autumn, 1964-76. By Clarence W. Davis. December 1972, iii + 13 p., 10 figs., 9 tables.

740. Food of fifteen northwest Atlantic gadiform fishes. By Richard W. Langton and Ray E. Bowman. February 1980, iv + 23 p., 3 figs., 11 tables.

741. Distribution of gammaridean Amphipoda (Crustacea) in the Middle Atlantic Bight region. By John J. Dickinson, Roland L. Wigley, Richard D. Brodeur, and Susan Brown-Leger. October 1980, vi + 46 p., 26 figs., 52 tables.

742. Water structure at Ocean Weather Station V, northwestern Pacific Ocean, 1966-71. By D. M. Husby and G. R. Seckel. October 1980, 18 figs., 4 tables.

743. Average density index for walleye pollock, *Theragra chalcogramma,* in the Bering Sea. By Loh-Lee Low and Ikuo Ikeda. November 1980, iii + 11 p., 3 figs., 9 tables.

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U.S. DEPARTMENT OF COMMERCE
Malcolm Baldrige, Secretary
National Oceanic and Atmospheric Administration
John V. Byrne, Administrator
National Marine Fisheries Service
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CONTENTS

Introduction 1

Bibliography 1

Subject index 11

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Annotated Bibliography and Subject Index on the Summer Flounder, *Paralichthys dentatus*

PAUL G. SCARLETT[1]

ABSTRACT

An annotated bibliography and subject index for 114 references are presented on the identity, distribution, life history, ecology, behavior, exploitation, and population dynamics of the summer flounder, *Paralichthys dentatus*.

INTRODUCTION

This bibliography consists of 114 references on the distribution, life history, ecology, behavior, and exploitation of the summer flounder, *Paralichthys dentatus* (Linneaus). Only those references that exclusively pertain to, supply important facts about (i.e., identifies limits of range), or contain a large section on summer flounder have been included. Popular articles have purposely been omitted.

References are listed alphabetically by author's surname. Those with multiple authors are listed only under the senior author's name. All works by the same author are listed chronologically by year of publication.

Brief annotations of the contents of each publication are given. The annotations are not intended to be value judgments, but are included to provide clearer descriptions of the contents of each publication than can be obtained from their titles. Where possible, the abstract of a publication was used as a guide to provide an annotation. Headings for the subject index are based on the outline provided by Rosa (1965[2]).

The search for literature on summer flounder was undertaken during the course of preparing a fishery management plan under the State/Federal Fisheries Management Program. Many of the references listed in the bibliography were provided by members of the Summer Flounder Scientific and Statistical Committee, notably Arnold Howe, Michael Fogarty, George Maltezos, John Poole, Stuart Wilk, Paul Hamer, Ronal Smith, James Casey, John Musick and John Gillikin. I also wish to thank the typist, Peggy Reno.

BIBLIOGRAPHY

ANDERSON, V. T., Jr.
1978. Reversed summer flounder (*Paralichthys dentatus* L.) from the Middle Atlantic Bight. Bull. N.J. Acad. Sci. 23(1):39-41.

Dextral summer flounder are described for the first time with a fully migrated left eye and normal dorsal fin origin. Morphometry and meristics are given for four specimens.

BEDSOLE, H. L., Jr., B. F. HOLLAND, Jr., and J. W. GILLIKIN.
1980. State of North Carolina R/V Dan Moore — cruise report no. 38. N.C. Div. Mar. Fish., 17 p.

A description of the distribution of summer flounder in the Atlantic Ocean between Cape Lookout, N.C., and Chesapeake Bay entrance is included. Mesh size regulations for the offshore trawl fishery are also discussed.

BIGELOW, H. B., and W. C. SCHROEDER.
1953. Fishes of the Gulf of Maine. U.S. Fish Wildl. Serv., Fish. Bull. 53, 557 p.

Includes a description, size range, seasonal movements, food habits, and range of summer flounder.

BOWMAN, R. E., R. O. MAURER, Jr., and J. A. MURPHY.
1976. Stomach contents of twenty-nine fish species from five regions in the northwest Atlantic — Data report. Natl. Mar. Fish. Serv., Northeast Fish. Cent. Woods Hole Lab., Lab. Ref. 76-10, 37 p.

Results of food habits studies showed that Pleuronectiformes occurred in the stomachs of a number of fish eating species. These data do not indicate the proportion of summer flounder among the flatfish prey, but they may be represented.

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[1] Nacote Creek Marine Fisheries Laboratory, New Jersey Division of Fish, Game and Wildlife, Star Route, Absecon, NJ 08201.

[2] Rosa, H. Jr. 1965. Preparation of synopses on the biology of species of living aquatic organisms. FAO Fisheries Biology Synopsis No. 1, Revision 1, 30 p.

BRIGGS, P. T.
1962. The sport fisheries of Great South Bay and vicinity. N.Y. Fish Game J. 9(1):1-36.

Over a million and a half summer flounder were taken from June through September. Suggests restrictions on summer flounder fishing during May and October.

BRUCE, R. A.
1967. North Atlantic trawl nets. U.S. Fish Wildl. Serv., Leafl. 600, 23 p.

The two most commonly used trawl nets were the number 36 otter trawl and the flounder trawl.

CHANG, S., and A. L. PACHECO.
1976. An evaluation of the summer flounder population in subarea 5 and statistical area 6. Int. Comm. Northwest Atl. Fish., Sel. Pap. 1, p. 59-71.

An analysis of the summer flounder stock in ICNAF Subarea 5 and Statistical Area 6 was made utilizing catch statistics, age-length and weight-length relationships. The estimated fishable population ranged from 36,000 to 74,000 metric tons from 1963 to 1974 and the MSY (maximum sustainable yield) of 20,000 to 22,000 tons was approximately 6,000 tons lower than the estimated 1974 harvest of the commercial and recreational fisheries.

CHRISTENSEN, D. J., and W. J. CLIFFORD.
1979. Composition of catches made by anglers fishing for summer flounder, *Paralichthys dentatus*, from New Jersey party boats in 1978. Mar. Fish. Rev. 41(12): 28-30.

Anglers were interviewed while fishing for summer flounder along the New Jersey coast from party boats. Mean seasonal catch rates for full-day and half-day anglers were 3.15 and 1.86 summer flounder per man per trip, respectively. A total of 828 summer flounder were measured and ages were determined for 427 specimens.

CHRISTENSEN, D. J., W. J. CLIFFORD, and G. SHEPHERD.
1978. Size and age composition of the northern New Jersey party boat catch of summer flounder (*Paralichthys dentatus*). Natl. Mar. Fish. Serv., Northeast Fish. Cent. Sandy Hook Lab., Lab Ref. SHL78-48, 8 p.

A total of 828 summer flounder were measured and 427 age samples were collected. Length frequencies and ages at length are presented.

CLARK, J. R.
1962. The 1960 salt-water angling survey. U.S. Dep. Inter., Bur. Sport Fish. Wildl., Circ. 153, 36 p.

Estimates the recreational catch of summer flounder.

CLIFFORD, W. J., and D. J. CHRISTENSEN.
1979. Length frequency of party and charter boat catch of summer flounder (*Paralichthys dentatus*), 1975-1978. Natl. Mar. Fish. Serv., Northeast Fish. Cent. Sandy Hook Lab., Lab Ref. SHL79-25.

Length frequencies of recreationally caught summer flounder are presented in computer printout form.

COLVOCORESSES, J. A., and J. A. MUSICK.
1979. Section II: NMFS groundfish survey. *In* Historical community structure analysis of finfishes, p. 45-78. Va. Inst. Mar. Sci. Spec. Rep. Appl. Mar. Sci. Ocean Eng. 198.

The composition and distribution of fish assemblages in the Middle Atlantic Bight are described. *Paralichthys dentatus* are regularly classified in the same group during spring and fall with *Prionotus carolinus, Stenotomus chrysops,* and *Centropristis striata.*

DAIBER, F. C., and R. W. SMITH.
1969. An analysis of the summer flounder population in the Delaware Bay area. Univ. Del., Mar. Lab., 26 p.

Age and growth analyses, food habits and length-frequency distributions are presented for summer flounder.

DEUBLER, E. E., Jr.
1958. A comparative study of the postlarvae of three flounders (*Paralichthys*) in North Carolina. Copeia 1958:112-116.

This paper includes data which makes it possible to distinguish the late postlarval forms of *Paralichthys dentatus, P. lethostigma,* and *P. albigutta.*

DEUBLER, E. E., Jr., and W. E. FAHY.
1958. A reversed ambicolorate summer flounder, *Paralichthys dentatus.* Copeia 1958:55.

An aberrant, female summer flounder 265 mm in standard length is described. This is only the second record of reversal and ambicoloration in the same individual.

DEUBLER, E. E., Jr., and J. C. WHITE, Jr.
1962. Influence of salinity on growth of postlarvae of the summer flounder, *Paralichthys dentatus.* Copeia 1962: 468-469.

Summer flounder postlarvae under controlled laboratory conditions showed an increase in growth with increasing salinities.

DEUEL, D. G.
1973. The 1970 salt-water angling survey. Natl. Mar. Fish. Serv., Curr. Fish. Stat. 6200, 54 p.

DEUEL, D. G., and J. R. CLARK.
1968. The 1965 salt-water angling survey. U.S Fish Wildl. Serv., Resour. Publ. 67, 51 p.

An estimate of the recreational catch of summer flounder is included in both references.

DuPAUL, W., and S. BAKER.

1979. The economic impact and status of the offshore fishing industry in Virginia. Va. Inst. Mar. Sci., Spec. Rep. Appl. Mar. Sci. Ocean Eng. 67, 51 p.

Summarizes the offshore fishing industry in Virginia in terms of its employment, income generated, and overall economic impact. Summer flounder constitute a high percentage of this fishery.

ELDRIDGE, P. J.

1962. Observations on the winter trawl fishery for summer flounder, *Paralichthys dentatus.* M.S. Thesis, College of William and Mary, Williamsburg, 58 p.

Data on the size composition of the marketable summer flounder landed at Hampton Roads, Va., were compiled in order to establish a base line to detect changes in the size composition of the summer flounder stocks. Information is also presented on spawning, length-weight relationships, and age and growth.

FESTA, P. J.

1974a. Analyses of market size composition data for the New Jersey summer flounder commercial fishery — 1967 through 1972. N.J. Div. Fish, Game Shellfish., Misc. Rep. 12M, 24 p.

A backlog of commercial dock receipts were analyzed to obtain size composition data for landings of summer flounder. Results did not support use of percent weight composition in monitoring stock recruitment rates. A review of summer flounder landings in New Jersey is also presented.

1974b. A study of the distribution of young and larval summer flounder in New Jersey estuarine waters. N.J. Div. Fish, Game Shellfish., Misc. Rep. 11M, 30 p.

Larvae and young were collected from a number of estuaries, demonstrating that New Jersey waters do act as nursery areas for summer flounder.

1977. Observations on the summer flounder (*Paralichthys dentatus*) sport fishery in Great Bay, N.J. during the summer of 1976 in reference to anoxic water conditions. *In* Oxygen depletion and associated environmental disturbances in the Middle Atlantic Bight in 1976. Natl. Mar. Fish. Serv., Northeast Fish. Cent. Sandy Hook Lab., Tech. Ser. Rep. 3, p. 463-470.

High variability in catch rates during July appeared to be directly related to movement of the anoxic water mass. Large numbers of summer flounder were forced into inlets and bays where they were more concentrated and vulnerable to the sport fishery.

1979a. Creel census of the summer flounder, *Paralichthys dentatus*, sportfishery in Great Bay, New Jersey. N.J. Div. Fish, Game Shellfish., Tech. Rep. 19M, 62 p.

Catch per effort statistics are provided for the sport fishery on summer flounder in Great Bay, N.J., from 1967 to 1976. The dependence of the fishery on the 2-year old class is documented.

1979b. Analyses of fish forage base of the Little Egg Harbor estuary. N.J. Div. Fish, Game Shellfish., Tech. Rep. 24M, 341 p.

Fish remains comprised 32.6% of the diet volume of 6-24 cm summer flounder and 74.3% of the volume of summer flounder from 25 to 65 cm. Prey are identified by species.

FIGLEY, W.

1977. Sex ratios within length groups of commercially caught summer flounder in New Jersey, 1962-1964. N.J. Div. Fish, Game Shellfish., Tech. Rep. 20M, 16 p.

Males comprised the majority of summer flounder in the centimeter groups below 46 cm, while females were predominant in larger length groups. The largest male sampled was 617 mm and the largest female was 730 mm.

FREEMAN, B. L., and S. C. TURNER.

1977. The effects of anoxic water on the summer flounder (*Paralichthys dentatus*), a bottom-dwelling fish. *In* Oxygen depletion and associated environmental disturbances in the Middle Atlantic Bight in 1976. Natl. Mar. Fish. Serv., Northeast Fish. Cent. Sandy Hook Lab., Tech. Ser. Rep. 3, p. 451-462.

The occurrence and distribution of summer flounder during the anoxic water condition is discussed. Distribution and catches of summer flounder were termed as very unusual.

FREEMAN, B. L., and L. A. WALFORD.

1974a. Anglers' guide to the United States Atlantic coast. Section II, Nantucket Shoals to Long Island Sound. U.S. Dep. Commer., Natl. Mar. Fish. Serv., 16 p.

1974b. Anglers' guide to the United States Atlantic coast. Section III, Block Island to Cape May, New Jersey. U.S. Dep. Commer., Natl. Mar. Fish. Serv., 21 p.

1974c. Anglers' guide to the United States Atlantic coast. Section IV, Delaware Bay to False Cape, Virginia. U.S. Dep. Commer., Natl. Mar. Fish. Serv., 17 p.

1976a. Anglers' guide to the United States Atlantic coast. Section V, Chesapeake Bay. U.S. Dep. Commer., Natl. Mar. Fish. Serv., 17 p.

1976b. Anglers' guide to the United States Atlantic coast. Section VI, False Cape, Virginia to Altamaha Sound, Georgia. U.S. Dep. Commer., Natl. Mar. Fish. Serv., 21 p.

1976c. Anglers' guide to the United States Atlantic coast. Section VII, Altamaha Sound, Georgia to Fort Pierce Inlet, Florida. U.S. Dep. Commer., Natl. Mar. Fish. Serv., 21 p.

This series describes the recreational fishery including seasonality, fishing methods, baits, and a description of each species. Summer flounder are included.

GINSBURG, I.
1952. Flounders of the genus *Paralichthys* and related genera in American waters. U.S. Fish Wildl. Serv., Fish. Bull. 52:267-351.

The summer flounder is described including its distribution, habitat, size, and bionomics.

GROSSLEIN, M. D., E. G. HEYERDAHL, and H. STERN, Jr.
1973. Status of the international fisheries off the Middle Atlantic coast. Natl. Mar. Fish. Serv., Northeast Fish. Cent. Woods Hole Lab., Lab. Ref. 73-4, p. 88.

Includes a brief description of the commercial and recreational summer flounder fisheries.

GUDGER, E. W.
1935. Two partially ambicolorate flatfishes (Heterosomata). Am. Mus. Novit. 1935 (768), 8 p.

A partially ambicolorate summer flounder is described.

1936. A reversed almost wholly ambicolorate summer flounder, *Paralichthys dentatus*. Am. Mus. Novit. 1936 (896), 5 p.

A reversed, almost ambicolorate summer flounder is described.

GUTHERZ, E. J.
1967. Field guide to the flatfishes of the family Bothidae in the western North Atlantic. U.S. Fish Wildl. Serv., Circ. 263, 47 p.

Includes a description of summer flounder and identifies its range.

HAMER, P. E., and F. E. LUX.
1962. Marking experiments on fluke (*Paralichthys dentatus*) in 1961. Minutes 21st Annu. Meet., Append. MA6, Atl. States Mar. Fish. Comm., 6 p.

Presents preliminary results of a joint summer flounder tagging program in the Middle Atlantic Bight. Summer flounder were found to be distributed in shallow coastal waters and bays during summer months. In winter and early spring the species was found on offshore grounds from Veatch Canyon, south to at least off the Virginia coast in 40-85 fathoms of water.

HENDERSON, E. M.
1979. Summer Flounder (*Paralichthys dentatus*) in the Northwest Atlantic. Natl. Mar. Fish Serv., Northeast Fish. Cent. Woods Hole Lab., Lab. Ref. 79-31, 13 p.

The paper reviews and summarizes data, analyses, and literature on summer flounder. Information presented includes results of aging studies, analyses of bottom trawl survey data, a fecundity study, a unit stock analysis, a von Bertalanffy growth curve, and weight-length curves.

HILDEBRAND, S. F., and L. E. CABLE.
1930. Development and life history of fourteen teleostean fishes at Beaufort, N.C. Bull. U.S. Bur. Fish. 46:383-488.

Estimated the minimum size at maturity for summer flounder to be 16.5″ (42 cm). Reported that small postlarval summer flounder are found at sea and in estuaries, larger postlarvae mainly in estuaries and juveniles in brackish water parts of estuaries.

HILDEBRAND, S. F., and W. C. SCHROEDER.
1928. Fishes of Chesapeake Bay. U.S. Bur. Fish. Bull. 43(1), 366 p.

Includes a description, food habits, seasonal movements and description of the commercial fishery for summer flounder.

HIMCHAK, P. J.
1979. Creel census of the summer flounder, *Paralichthys dentatus*, sportfishery in Great Bay, New Jersey. N.J. Div. Fish, Game Shellfish., Dingell-Johnson Rep. Proj. F-15-R, 22 p.

Catch rates, length-frequency distributions, total harvest, and instantaneous loss rates are provided for the summer flounder fishery.

HOSS, D. E.
1964. Accumulation of zinc-65 by flounder of the genus *Paralichthys*. Trans. Am. Fish. Soc. 93:364-368.

When concentration factors were calculated, it was found summer flounder concentrated zinc-65 to higher levels from food than from water.

1967. Marking post-larval paralichthid flounders with radioactive elements. Trans. Am. Fish. Soc. 96:151-156.

Both cerium 144 and cobalt 60, introduced into the food or water, were used satisfactorily as marks for postlarval summer flounder.

HUSSAKOF, L.
1914. On two ambicolorate specimens of the summer flounder, (*Paralichthys dentatus*), with an explanation of ambicoloration. Bull. Am. Mus. Nat. Hist. 33:95-100.

Two ambicolorate summer flounder are described.

JENSEN, A. C.

1967. A brief history of the New England offshore fisheries. U.S. Fish Wildl. Serv., Fish. Leafl. 594, 14 p.

Describes the origin and subsequent development of several of the offshore fisheries, including summer flounder, of New England.

1974. New York's fisheries for scup, summer flounder, and black sea bass. N.Y. Fish Game J. 21:126-134.

Reviews the commercial summer flounder fishery engaged in by New York State fishermen in the Middle Atlantic Bight. Reports on a decline in abundance based on a decline in commercial landings.

JOHNSON, K. L.

1979. Yield per recruit analysis for summer flounder (*Paralichthys dentatus*). Natl. Mar. Fish. Serv., Northeast Fish. Cent. Woods Hole Lab., Lab. Ref. 79-34, 2 p.

The Beverton and Holt yield per recruit model was applied to summer flounder.

LANGTON, R. W.

1979. Food of nine northwest Atlantic Pleuronectiform fishes. Natl. Mar. Fish. Serv., Northeast Fish. Cent. Woods Hole Lab., Lab. Ref. 79-17, 83 p.

Summarizes data on the food of summer flounder collected during Northeast Fisheries Center bottom trawl surveys. Prey species included squid, scup, and silver hake.

LEIM, A. H., and W. B. SCOTT.

1966. Fishes of the Atlantic coast of Canada. Fish. Res. Board Can. Bull. 155, 485 p.

Sets the northern limit of the summer flounder range as LaHave Bank, Nova Scotia.

LUX, F. E., P. E. HAMER, and J. C. POOLE.

1966. Summer flounder...the Middle Atlantic flatfish. Atl. States Mar. Fish. Comm., Leafl. 6, 4 p.

Provides a general overview of summer flounder including a description of the commercial and recreational fisheries, distribution, and seasonal movements.

LUX, F. E., and F. E. NICHY.

1980. Movements of tagged summer flounder, *Paralichthys dentatus*, off southern New England. Natl. Mar. Fish. Serv., Northeast Fish. Cent. Woods Hole Lab., Lab. Ref. Doc. 80-34, 36 p.

A description of the seasonal and long-term movements of summer flounder off southern New England is included. Over 2,800 summer flounder were tagged on both coastal and offshore grounds in 1961-62.

LUX, F. E., J. C. POOLE, and P. E. HAMER.

1962. A status report on the fluke or summer flounder (*Paralichthys dentatus*). Minutes 21st Annu. Meet., Append. MA-3, Atl. States Mar. Fish. Comm., 4 p.

Reviews the general biology, nature and status of the fisheries, and recent research for summer flounder.

LUX, F. E., and L. R. PORTER, Jr.

1966. Length-weight relation of the summer flounder *Paralichthys dentatus* (Linnaeus). U.S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. 531, 5 p.

Length-weight equations of the form $W = cL^b$ in which W is weight, L is length, and c and b are constants, are given for summer flounder for each calendar quarter. Weight for a given length varied seasonally. Males were slightly heavier than females of the same length.

MAHONEY, J. B., F. H. MIDLEDGE, and D. G. DEUEL.

1973. A fin rot disease of marine and euryhaline fishes in the New York Bight. Trans. Am. Fish. Soc. 102: 596-605.

Summer flounder were affected. External signs of the disease were fin necrosis, skin hemorrhages, skin ulcers, and occasional blindness.

MARSHALL, A.

1980. Data on the commercial sport fishery for summer flounder, *Paralichthys dentatus*, in Virginia. Va. Mar. Resour. Rep. 80-5, 5 p.

Describes the temporal and spacial setting, trends in the recreational catch, demography of the participants, modes of fishing, disposition of catch and economic impact of the summer flounder charter and party boat fishery.

MAST, S. O.

1916. Changes in shade, color and pattern in fishes, and their bearing on the problems of adaption and behavior, with especial reference to the flounders *Paralichthys* and *Ancylopsetta*. Bull. U.S. Bur. Fish. 34:173-238.

Summer flounder simulate rather than reproduce the background and respond more rapidly to yellows and browns than to reds, greens, and blues.

MAYO, R. K.

1975. Length frequencies of flounders other than yellowtail. Int. Comm. Northwest Atl. Fish. Work. Pap. 64, 9 p.

Computer plotted length frequencies of summer flounder from fall cruises of *Albatross IV* in 1963, 1969, 1972, and 1973 are presented.

1976. Assessment data for flounders other than yellowtail in ICNAF subarea 5 and statistical area 6. Int. Comm. Northwest Atl. Fish. Work. Pap. 76/IV/47, 7 p.

Stratified mean catch per tow in numbers and pounds and length frequencies from autumn U.S. research cruises from 1963 to 1975 are given for summer flounder.

MELDRIM, J. W.

1976. Affinities and diversity of fishes of the Delaware River estuary in the vicinity of the Salem nuclear generating station. *In* An ecological study of the Delaware River in the vicinity of Artificial Island, p. 146-155. Ichthyological Associates, Inc., Ithaca, N.Y.

Summer flounder were found to have a positive affinity with bay anchovy, weakfish, spot, and hogchocker.

MORSE, W. W.

1978. Preliminary fecundity estimates of summer flounder (*Paralichthys dentatus*) occurring in Middle Atlantic waters. Natl. Mar. Fish. Serv., Northeast Fish. Cent. Sandy Hook Lab., Lab. Ref. 78-39, 5 p.

Fecundity estimates ranged from 414,000 to 4,188,000 eggs for summer flounder between 366 and 680 mm TL. Preliminary observations indicated a curvilinear relationship between fecundity and length.

1979. An analysis of maturity observations of 12 goundfish species collected from Cape Hatteras, North Carolina to Nova Scotia in 1977. Natl. Mar. Fish. Serv., Northeast Fish. Cent. Sandy Hook Lab., Rep. SHL 79-32, 20 p.

Summer flounder is included in the analysis. The L_{50} (length at which 50% of the fish are mature) was 24.6 cm TL for males and 28.4 cm TL for females.

In press. Reproduction of the summer flounder, *Paralichthys dentatus* (L). J. Fish Biol., Vol. 19.

Length at maturity for summer flounder ranged from 23.7 to 27.3 cm TL for males and from 30.2 to 33.3 cm TL for females which coincided with length at age 2. Fecundity was related to length, weight, and ovary weight.

MURAWSKI, W. S.

1970. Results of tagging experiments of summer flounder, *Paralichthys dentatus*, conducted in New Jersey waters from 1960-1967. N.J. Div. Fish., Game Shellfish., Misc. Rep. 5M, 72 p.

Reports on six tagging experiments of summer flounder. Monthly movements, estimates of harvest rates and survival rates are presented for each of the six groups.

MURAWSKI, W. S., and P. FESTA.

1976. Ovary maturation in the summer flounder, *Paralichthys dentatus*. N.J. Div. Fish, Game Shellfish., Misc. Rep. 16M, 16 p.

Four distinct summer flounder egg types were characterized as to diameter and yolk development. Correlation of ovary condition with date of capture indicated peak spawning activity occurred during October and November.

MURAWSKI, W. S., and R. L. WHITE.

1964. Studies of the reproduction of the summer flounder, *Paralichthys dentatus*. N.J. Div. Fish, Game Shellfish., Dingell-Johnson Rep. Proj. F-15-R, 1 p.

Ovaries of commercially caught summer flounder landed in New Jersey were examined. The data indicated that spawning commenced during the last half of September, continued during October, reached its peak during the first half of November, and ended in the latter half of December.

MUSICK, J. A.

1979. Section III: A summary of the distribution, abundance, and food habits of demersal fishes of the Mid-Atlantic outer continental shelf—a concise source document for resource managers and users. *In* Historical community structure analysis of finfishes, p. 79-88. Va. Inst. Mar. Sci., Spec. Rep. Appl. Mar. Sci. Ocean Eng. 198.

Paralichthys dentatus is included in the summary.

MUSICK, J. A., and J. D. McEACHRAN.

1968. Seasonal distribution of major species of demersal fishes in Chesapeake Bight. Va. Inst. Mar. Sci., 13 p.

Species were divided into two groups. One group (warm-temperate), having southern affinities and including summer flounder, is found inshore during the summer and migrates offshore or to the south or both during the winter.

NESBIT, R. A., and W. C. NEVILLE.

1935. Conditions affecting the southern winter trawl fishery. [U.S.] Bur. Fish., Fish. Circ. 18, 12 p.

An early description of the fishery is presented. Summer flounder is identified as one of the three most important species in the fishery.

OLLA, B. L., C. E. SAMET, and A. L. STUDHOLME.

1972. Activity and feeding behavior of the summer flounder (*Paralichthys dentatus*) under controlled laboratory conditions. Fish. Bull., U.S. 70:1127-1136.

Three general behavior patterns were exhibited: resting, swimming, and feeding. Prey was captured equally well on the bottom or in the water column. The significance of behavior patterns and their relation to those of other flatfishes is discussed.

OSBORN, C. M.

1939. The physiology of color change in flatfishes. J. Exp. Zool. 81:479-515.

When undisturbed, summer flounder become very homogeneous in shade. They become well adjusted to a white background in 2-4 days and a black background in 1-3 days.

1941. Studies on the growth of integumentary pigment in the lower vertebrates. I. The origin of artificially developed melanophores on the normally unpigmented ventral surface of the summer flounder (*Paralichthys dentatus*). Biol. Bull., Woods Hole 81:341-351.

Melanophores differentiate on the normally unpigmented ventral surface of summer flounder when that surface is exposed to a light source and the animal is in a physiological condition favoring darkening. The melanophores develop in situ from melanoblasts.

PEARCY, W. G., and S. W. RICHARDS.

1962. Distribution and ecology of fishes of the Mystic River estuary, Connecticut. Ecology 43:248-259.

Includes length frequencies of summer flounder. Juveniles were captured, suggesting the area is used as a nursery area.

PEARSON, J. C.

1932. Winter trawl fishery off the Virginia and North Carolina coasts. [U.S.] Bur. Fish., Invest. Rep. 10, 31 p.

A description of the fishery is presented, including location, methods, and composition of the catch. Summer flounder is identified as one of the principal species in the fishery.

PERLMUTTER, A.

1959. Changes in the populations of fishes and in their fisheries in the Middle Atlantic and Chesapeake regions, 1930 to 1955. Trans. N.Y. Acad. Sci., Ser. II, 21:484-496.

Reports on an increase of summer flounder landings due to an increase in fishing activity. Provides a historical review of the fishery.

PETERS, D. S., and J. W. ANGELOVIC.

1971. Effect of temperature, salinity, and food availablity on growth and energy utilization of juvenile summer flounder, *Paralichthys dentatus*. *In* D. J. Nelson (editor), Proc. 3d Natl. Symp. Radioecology USAEC Conf., -710501-PI, p. 545-554. NTIS (Natl. Tech. Inf. Serv.), Springfield, Va.

Growth rates were faster at high temperatures and rapid feeding rates even though the greatest efficiency was near two-thirds ad libitum feeding and from 20° to 25 °C. Growth rates predicted from assimilation and respiration rates did not correspond with measured growth.

PETERS, D. S., and M. A. KJELSON.

1975. Consumption and utilization of food by various postlarval and juvenile fishes of North Carolina estuaries. *In* L. E. Cronin (editor), Estuarine research, Vol. I, p. 448-472. Academic Press, New York.

At warm temperatures, summer flounder grew faster at intermediate to high salinities.

POOLE, J. C.

1961. Age and growth of the fluke in Great South Bay and their significance to the sport fishery. N.Y. Fish Game J. 8:1-18.

The age of summer flounder was determined from annular markings on the otolith. Growth was back-calculated according to the annuli for 357 fish. Females grew significantly faster than males. The sport fishery landed primarily 1- and 2-yr-old summer flounder.

1962. The fluke population of Great South Bay in relation to the sport fishery. N.Y. Fish Game J. 9: 93-117.

From 1956 to 1959, 5,845 summer flounder were tagged. Returns showed little movement of summer flounder out of the bay during summer, but they indicated heavy early season fishing to be an important factor in the decline in late season fishing success.

1964. Feeding habits of the summer flounder in Great South Bay. N.Y. Fish Game J. 11:28-34.

Stomachs from 1,210 summer flounder collected in 1958 and 1959 were examined. The fish had fed on a wide variety of organisms, but mainly upon sand shrimp and winter flounder. Feeding activity remained constant throughout the summer.

1966. A review of research concerning summer flounder and needs for further study. N.Y. Fish Game J. 13: 226-231.

This paper recommends that future research on summer flounder should include racial studies, studies on larvae and postlarvae to delineate the early nursery grounds, and a cooperative study of the migratory patterns of immature fish.

POWELL, A. B.

1974. Biology of the summer flounder, *Paralichthys dentatus*, in Pamlico Sound and adjacent waters, with comments on *P. lethostigma*, and *P. albigutta*. M.S. Thesis, Univ. North Carolina, Chapel Hill, 145 p.

Includes sections on the age and growth, food habits, nursery areas, and spawning of summer flounder.

POWELL, A. B., B. F. HOLLAND, and J. GILLIKIN.

1975a. State of North Carolina R/V Dan Moore — cruise report no. 2, Currituck Beach to Cape Lookout Bight. N.C. Div. Mar. Fish., 29 p.

Includes a discussion on a summer flounder tagging program and describes general migration trends of summer flounder tagged off North Carolina.

1975b. State of North Carolina R/V Dan Moore —

cruise report no. 3, Currituck Beach to Bogue Inlet. N.C. Div. Mar. Fish., 30 p.

A description of the distribution and catch per unit of effort of summer flounder between Currituck Beach and Bogue Inlet are included.

POWELL, A. B., and F. J. SCHWARTZ.
1972. Anomalies of the genus *Paralichthys* (Pisces, Bothidae), including an unusual double-tailed southern flounder, *Paralichthys lethostigma*. J. Elisha Mitchell Sci. Soc. 88:155-161.

Includes a description of a summer flounder with almost complete ambicoloration.

1977. Distribution of Paralichthid flounders (Bothidae: *Paralichthys*) in North Carolina estuaries. Chesapeake Sci. 18:334-339.

Paralichthys dentatus and *Paralichthys lethostigma* were found to use Pamlico Sound and adjacent estuaries as nursery areas. Benthic substrate and salinity are the two most important factors governing distribution.

1979. Food of *Paralichthys dentatus* and *P. lethostigma* (Pisces: Bothidae) in North Carolina estuaries. Estuaries 2:276-279.

The diet of *Paralichthys dentatus* in Pamlico Sound, N.C. is given for juveniles and adults.

PURVIS, C.
1976. Nursery area survey of northern Pamlico Sound and tributaries. N.C. Div. Mar. Fish., 62 p.

Data indicate a general distributional difference between summer flounder and southern flounder in relation to salinity. Southern flounder were more abundant at salinities below 12 ppt whereas summer flounder were more abundant at salinities greater than 12 ppt. The study was unable to designate nursery areas for summer flounder because of low salinities of the study area.

REINTJES, J. W., and C. M. ROITHMAYR.
1960. Survey of the ocean fisheries off Delaware Bay. U.S. Fish Wildl. Serv., Spec. Sci. Rep. 347, 18 p.

Measurements of catch, catch per unit effort, and total fishing effort for the major fisheries of the area are given for the years 1954-57. Summer flounder made up a large proportion of the inshore and offshore otter trawl fisheries.

SCHAEFER, R. H.
1966. A preliminary report concerning the effectiveness of New York's 14-inch minimum size limit on the summer flounder sport fishery. Minutes 25th Annu. Meet., Atl. States Mar. Fish. Comm., p. 38-44.

Data suggest that when a large percentage of sublegal summer flounder are present in the population at the beginning of a fishing period, the catch rate can be stabilized throughout the entire fishing period via size regulations

SHEPHERD, G.
1980. A comparative study of aging methods for summer flounder (*Paralichthys dentatus*). Natl. Mar. Fish. Serv., Northeast Fish. Cent. Woods Hole Lab., Lab. Ref. 80-13, 26 p.

This paper compares the use of otoliths, scales, and fin rays for aging summer flounder. Back-calculated lengths at age for the three age structures were compared and then used to determine growth rates. Scales and fin rays were preferred because the annuli were usually more distinct.

SISSENWINE, M. P., R. R. LEWIS, and R. K. MAYO.
1979. The spatial and seasonal distribution of summer flounder (*Paralichthys dentatus*) based on research vessel bottom trawl surveys. Natl. Mar. Fish. Serv., Northeast Fish. Cent. Woods Hole Lab., Lab. Ref. 79-55, 101 p.

The distribution of summer flounder is described based on depth, bottom water temperature, geographic location, season, and size.

SMITH, R. W.
1969. An analysis of the summer flounder, *Paralichthys dentatus*, population in the Delaware Bay. M.S. Thesis, Univ. Delaware, Newark, 72 p.

Summer flounder were found from the middle of April to the middle of November. Morphometric and meristic characters were presented. The age composition, length-weight relationship, maturity information, and food habits are included.

SMITH, R. W., and F. C. DAIBER.
1977. Biology of the summer flounder, *Paralichthys dentatus*, in Delaware Bay. Fish. Bull., U.S. 75: 823-830.

Data on the age, growth, food habits, and racial characters of summer flounder from Delaware Bay are given.

SMITH, W. G.
1973. The distribution of summer flounder, *Paralichthys dentatus*, eggs and larvae on the continental shelf between Cape Cod and Cape Lookout, 1965-66. Fish. Bull., U.S. 71:527-548.

The most productive summer flounder spawning grounds were located off New York and New Jersey. Spawning began in the northern parts of the survey area, progressed southward with the season, and ended off Cape Lookout.

SMITH, W. G., and M. P. FAHAY.
1970. Description of eggs and larvae of the summer

flounder, *Paralichthys dentatus*. U.S. Fish Wildl. Serv., Res. Rep. 75, 21 p.

Described artificially fertilized summer flounder eggs and larvae hatched in the laboratory or captured at sea.

UNITED STATES DEPARTMENT OF COMMERCE.
1977. Foreign trawl fisheries of Northwestern Atlantic, incidental catching of finfish. Federal Register 42: 9950-9986.
1978. Foreign fishing regulations, activities within the United States Fishery Conservation Zone. Federal Register 43:59292-59325.

Summer flounder are included and regulated by law under the above two references by a heading of "other finfish." All species under this heading must be caught only as an incidental catch by foreign vessels.

UNITED STATES DEPARTMENT OF COMMERCE, BUREAU OF FISHERIES.
1930-1940. Fishery industries of the United States, 1929 to 1938. Appendices to Reports of the United States Commissioner of Fisheries for the fiscal years 1930-39, 11 vols.

UNITED STATES DEPARTMENT OF COMMERCE, NATIONAL MARINE FISHERIES SERVICE.
1971-1978. Fishery statistics of the United States, 1968 to 1975. U.S. Natl. Mar. Fish. Serv., Stat. Dig. 62-69.

The above two references list commercial landings and value of the catch of summer flounder.

1980. Marine recreational fishery statistics survey, Atlantic and Gulf Coasts. Natl. Mar. Fish. Serv., Curr. Fish. Stat. 8063, 139 p.

The recreational catch of summer flounder from November 1978 to October 1979 by region, state, mode and distance from shore is provided.

UNITED STATES DEPARTMENT OF INTERIOR, FISH AND WILDLIFE SERVICE.
1942-1969. Fishery statistics of the United States, 1939 to 1967. U.S. Fish Wildl. Serv., Bur. Commer. Fish., Stat. Dig. 1, 4, 7, 11, 14, 16, 18, 19, 21, 22, 25, 27, 30, 34, 36, 39, 41, 43, 44, 49, 51, 53, 54, 56-61.

Lists the commercial landings and value of the catch of summer flounder.

WESTMAN, J. R., and W. C. NEVILLE.
1946. Some studies on the life history and economics of the fluke (*Paralichthys dentatus*) of Long Island waters. An investigation sponsored jointly by State of New York Conservation Department, U.S. Department of the Interior, and Town of Islip, N.Y., 15 p.

Describes seasonal migrations and local movements of summer flounder.

WHITE, J. C., Jr., and D. E. HOSS.
1964. Another record of incomplete ambicoloration in the summer flounder, *Paralichthys dentatus*. Chesapeake Sci. 5:151-152.

A description of a summer flounder with incomplete ambicoloration is provided.

WIDERSTROM, F. L., Jr.
1959. An economic and financial study of the fluke otter-trawl fishery of New Jersey. Comm. Fish. Rev. 21(12):7-26.

Describes the fishing gear used by New Jersey trawlers for both the inshore and offshore summer flounder fisheries. Includes an economic evaluation of the fishery.

WILK, S. J., and W. W. MORSE.
1979. Annual cycle of gonad-somatic indices as indicators of spawning times for 15 species of fish collected from the New York Bight. Natl. Mar. Fish. Serv., Northeast Fish. Cent. Sandy Hook Lab., Lab. Ref. SHL 79-11, 54 p.

Summer flounder are included. The study indicated that spawning occurs from October through February.

WILK, S. J., W. W. MORSE, and D. E. RALPH.
1978. Length-weight relationships of fishes collected in the New York Bight. Bull. N.J. Acad. Sci. 23(2): 58-64.

Average length-weight relationships are presented for 78 species of fishes, including summer flounder, collected during a trawl survey. A significant difference in the length-weight relationships was found between summer flounder males and females.

WILK, S. J., W. W. MORSE, D. E. RALPH, and E. J. STEADY.
1975. Life history aspects of New York Bight finfishes. Natl. Mar. Fish. Serv., Northeast Fish. Cent. Sandy Hook Lab., Lab. Ref. SHL 75-1, 265 p.

Includes monthly length frequencies, weight-length relationships, sex ratios, monthly gonad somatic indices, and distribution of summer flounder.

1976. Life history aspects of Middle Atlantic Bight finfishes. Natl. Mar. Fish. Serv., Northeast Fish. Cent. Sandy Hook Lab., Lab. Ref. 76-3, 149 p.

Includes sex ratios and size ranges of summer flounder collected in the Middle Atlantic Bight.

WILK, S. J., W. G. SMITH, D. E. RALPH, and J. SIBUNKA.
1980. Population structure of summer flounder between New York and Florida based on linear discriminant analysis. Trans. Am. Fish. Soc. 109:265-271.

A stepwise linear discriminant analysis was used to investigate the population structure of summer flounder based on 18 morphometric and meristic variables. Two populations were identified: one in the Middle Atlantic Bight, or between New York and Cape Hatteras, N.C.; the other in the South Atlantic Bight, or between Cape Hatteras and Florida.

WILLIAMS, A. B., and E. E. DEUBLER.
1968a. A ten-year study of meroplankton in North Carolina estuaries: assessment of environmental factors and sampling success among Bothid flounders and Penaeid shrimps. Chesapeake Sci. 9:27-41.

The effects of salinity, temperature, current velocity, wind direction, mechanical clogging of nets, and lunar phase on sampling of postlarval flounders, including summer flounder, are discussed.

1968b. Studies on macroplanktonic crustaceans and ichthyoplankton of the Pamlico Sound complex. N.C. Dep. Conserv. Dev., Spec. Sci. Rep. 13, 91 p.

Metamorphosing young of summer flounder were collected from surface waters at all stations within the Neuse River complex. Recruitment into the river system occurred from January to April. Monthly length distributions of larvae and young are provided.

WOOLCOTT, W. S., C. BEIRNE, and W. H. HALL, Jr.
1968. Descriptive and comparative osteology of the young of three species of flounders, genus *Paralichthys.* Chesapeake Sci. 9:109-120.

A comparative skeletal study was made of the young (10-130 mm) of three closely related species of flounders—*Paralichthys dentatus, Paralichthys lethostigma,* and *Paralichthys albigutta.* Osteologically, vertebral and pterygiophore numbers produced the best separation with *P. dentatus* having the highest counts. Total gill rakers on the first gill arch and lateral line scales were useful characters with the highest numbers again appearing in *P. dentatus.*

SUBJECT INDEX

- Identity
  - Specific
    - Bigelow and Schroeder 1953
    - Deubler 1958
    - Ginsburg 1952
    - Gutherz 1967
    - Hildebrand and Schroeder 1928
    - Smith 1969
    - Smith and Daiber 1977
    - Woolcott et al. 1968
  - Morphology
    - Anderson 1978
    - Ginsburg 1952
    - Smith 1969
    - Smith and Daiber 1977
    - Wilk et al. 1980
- Distribution
  - Bedsole et al. 1980
  - Bigelow and Schroeder 1953
  - Colvocoresses and Musick 1979
  - Festa 1974b
  - Ginsburg 1952
  - Gutherz 1967
  - Hamer and Lux 1962
  - Henderson 1979
  - Hildebrand and Cable 1930
  - Hildebrand and Schroeder 1928
  - Leim and Scott 1966
  - Lux et al. 1966
  - Murawski 1970
  - Musick 1979
  - Musick and McEachran 1968
  - Pearcy and Richards 1962
  - Poole 1962, 1966
  - Powell et al. 1975b
  - Powell and Schwartz 1977
  - Purvis 1976
  - Sissenwine et al. 1979
  - Wilk et al. 1975
- Bionomics and life history
  - Reproduction
    - Eldridge 1962
    - Ginsburg 1952
    - Henderson 1979
    - Hildebrand and Cable 1930
    - Morse 1978, 1979, In press
    - Murawski and Festa 1976
    - Murawski and White 1964
    - Powell 1974
    - Smith, R. W. 1969
    - Smith and Daiber 1977
    - Smith, W. G. 1973
    - Smith and Fahay 1970
    - Wilk and Morse 1979
    - Wilk et al. 1975
  - Preadult phase
    - Deubler 1958
    - Deubler and White 1962
    - Festa 1974b
    - Ginsburg 1952
    - Hoss 1967
    - Murawski and Festa 1976
    - Murawski and White 1964
    - Smith 1973
    - Smith and Fahay 1970
    - Williams and Deubler 1968a, b
  - Adult phase
    - Anderson 1978
    - Bowman et al. 1976
    - Deubler and Fahay 1958
    - Ginsburg 1952
    - Gudger 1935, 1936
    - Hoss 1964
    - Hussakof 1914
    - Mahoney et al. 1973
    - Powell and Schwartz 1972
    - Smith 1973
    - White and Hoss 1964
- Nutrition and growth
  - Feeding
    - Ginsburg 1952
    - Olla et al. 1972
    - Peters and Angelovic 1971
    - Poole 1964
  - Food
    - Bigelow and Schroeder 1953
    - Diaber and Smith 1969
    - Festa 1979b
    - Ginsburg 1952
    - Hildebrand and Schroeder 1928
    - Langton 1979
    - Poole 1964
    - Powell 1974
    - Powell and Schwartz 1979
    - Smith 1969
    - Smith and Daiber 1977
  - Growth rate
    - Chang and Pacheco 1976
    - Diaber and Smith 1969
    - Deubler and White 1962
    - Eldridge 1962
    - Henderson 1979
    - Peters and Angelovic 1971
    - Peters and Kjelson 1975
    - Poole 1961
    - Powell 1974
    - Shepherd 1980
    - Smith 1969
    - Smith and Diaber 1977
  - Metabolism
    - Peters and Angelovic 1971
    - Peters and Kjelson 1975
- Behavior
  - Migrations and local movements
    - Bigelow and Schroeder 1953
    - Ginsburg 1952
    - Hamer and Lux 1962
    - Hildebrand and Schroeder 1928
    - Lux et al. 1966
    - Lux and Nichy 1980
    - Murawski 1970
    - Musick and McEachran 1968
    - Poole 1962, 1966
    - Powell et al. 1975a
    - Westman and Neville 1946
  - Responses to stimuli
    - Festa 1977
    - Freeman and Turner 1977
    - Mast 1916
    - Osborn 1939, 1941
    - Olla et al. 1972
    - Peters and Angelovic 1971
- Population
  - Sex ratio
    - Eldridge 1962
    - Figley 1977
    - Morse In press
    - Murawski 1970
    - Murawski and White 1964
    - Smith 1969
    - Smith and Daiber 1977
    - Wilk et al. 1975, 1976
  - Age composition
    - Chang and Pacheco 1976
    - Christenson and Clifford 1979
    - Christensen et al. 1978
    - Diaber and Smith 1969
    - Eldridge 1962
    - Henderson 1979
    - Poole 1961
    - Powell 1974
    - Shepherd 1980
    - Smith 1969
    - Smith and Daiber 1977
  - Size composition
    - Chang and Pacheco 1976
    - Christensen and Clifford 1979
    - Christensen et al. 1978
    - Clifford and Christensen 1979
    - Eldridge 1962
    - Festa 1974a, 1979a
    - Figley 1977
    - Himchak 1979
    - Lux and Porter 1966
    - Mayo 1975, 1976
    - Murawski 1970
    - Pearcy and Richards 1962
    - Poole 1961, 1962
    - Sissenwine et al. 1979
    - Smith 1969
    - Smith and Daiber 1977
    - Wilk, Morse, Ralph, and Steady 1975, 1976
    - Wilk, Smith, Ralph, and Sibunka 1978
    - Williams and Deubler 1968b
  - Abundance and density
    - Henderson 1979
    - Jensen 1974
    - Mayo 1976
    - Perlmutter 1959
    - Poole 1962
    - Powell 1974

- Natality and recruitment
  - Chang and Pacheco 1976
  - Henderson 1979
  - Johnson 1979
  - Morse 1978, In press
- Mortality and morbidity
  - Chang and Pacheco 1976
  - Festa 1977, 1979a
  - Henderson 1979
  - Murawski 1970
- Dynamics
  - Chang and Pacheco 1976
  - Henderson 1979
  - Johnson 1979
- Population in community and ecosystem
  - Colvocoresses and Musick 1979
  - Meldrim 1976
  - Musick 1979
  - Musick and McEachran 1968

Exploitation (commercial and recreational)
- Fishing equipment
  - Bedsole et al. 1980
  - Bruce 1976
  - DuPaul and Baker 1979
  - Eldridge 1962
  - Jensen 1967
  - Pearson 1932
  - Perlmutter 1959
  - Reintjes and Roithmayr 1960
  - Widerstrom 1959
- Fishing areas and seasons
  - Briggs 1962
  - DuPaul and Baker 1979
  - Eldridge 1962
  - Festa 1979a
  - Freeman and Walford 1974a, b, c, 1976 a, b, c
  - Grosslein et al. 1973
  - Jensen 1967
  - Marshall 1980
  - Nesbit and Neville 1935
  - Pearson 1932
  - Perlmutter 1959
  - Reintjes and Roithmayr 1960
- Fishing operations and results
  - Briggs 1962
  - Christensen and Clifford 1979
  - Christensen et al. 1978
  - Clark 1962
  - Deuel 1973
  - Deuel and Clark 1968
  - DuPaul and Baker 1979
  - Eldridge 1962
  - Freeman and Walford 1974a, b, c, 1976a, b, c
  - Festa 1974a, 1977, 1979a
  - Grosslein et al. 1973
  - Himchak 1979
  - Lux et al. 1962, 1966
  - Mayo 1976
  - Marshall 1980
  - Nesbit and Neville 1935
  - Pearson 1932
  - Perlmutter 1959
  - Poole 1962
  - Reintjes and Roithmayr 1960
  - United States Department of Commerce, Bureau of Fisheries 1930-1940
  - United States Department of Commerce, National Marine Fisheries Service 1971-1978, 1980
  - United States Department of Interior, Fish and Wildlife Service 1942-1969
  - Widerstrom 1959

Protection and Management
- Bedsole et al. 1980
- Schaefer 1966
- United States Department of Commerce 1977, 1978

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CONTENTS OF MANUSCRIPT

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